CLAIMS

What is claimed is:

1. An apparatus comprising:

a first conveyor adapted to convey a first stream of products;

a gapper positioned adjacent the first conveyor to receive and reorient the first stream of products into a vertical queue;

a second conveyor selectively operable to clutch the bottom surface of exposed products and advance the products to define a second stream of products; and

a third conveyor receiving the second stream from the second conveyor and transferring it to a process device, the third conveyor having an operating speed that is variable and that is selectively different than the operating speed of the second conveyor.

2. The apparatus of claim 1, wherein the first conveyor delivers products at a substantially constant rate.

3. The apparatus of claim 1, wherein the first conveyor is driven by a variable speed drive.

4. The apparatus of claim 1, wherein the gapper includes a stop member positioned to deflect the products into the vertical queue.

5. The apparatus of claim 4, wherein the stop member is positioned adjacent the second conveyor to define a metering gate therebetween.

6. The apparatus of claim 1, wherein the gapper further includes a support member having first and second support surfaces.

7. The apparatus of claim 6, wherein the first and second support surfaces are spaced apart to define a conveyor space therebetween and wherein the second conveyor is disposed at least partially within the space.

8. The apparatus of claim 1, wherein the second conveyor includes a belt having a plurality of apertures therein.

9. The apparatus of claim 8, wherein the apertures are substantially equally spaced.

10. The apparatus of claim 1, wherein the second conveyor includes a variable speed drive.

11. The apparatus of claim 10, wherein the variable speed drive selectively stops advancement to prevent the second conveyor from advancing the second stream of products, thereby defining a gap.

12. The apparatus of claim 1, further comprising a vacuum plate, the vacuum plate in fluid communication with a vacuum source and cooperating with the second conveyor to selectively clutch products in the queue.

13. The apparatus of claim 12, wherein the vacuum plate is movable to vary the spacing between adjacent products within the second stream.

14. The apparatus of claim 12, wherein the fluid communication between the vacuum plate and the vacuum is selectively terminated to prevent the second conveyor from advancing products, thereby defining a gap in the second stream.

15. The apparatus of claim 1, further comprising a nip roller operable to prevent the passage of products from the vertical queue to the third conveyor.

16. The apparatus of claim 1, wherein the gapper is movable to discharge the products within the vertical queue to a waste path.

17. The apparatus of claim 1, wherein the process device includes a stacker operable to produce a log of products.

18. An apparatus operable to produce a stream of products having a desired product spacing, the apparatus comprising:

a conveyor disposed beneath a vertical queue of products, the conveyor including a plurality of substantially equally spaced apertures; and

a vacuum plate disposed beneath the conveyor, in fluid communication with a vacuum source and including a plurality of apertures alignable with the plurality of apertures of the second conveyor, the vacuum plate movable between a first position and a second position;

wherein when the vacuum plate is in the first position the second conveyor clutches an exposed bottom surface of the products in the queue to advance the products in sequence and produce a shingled stream of products having a first spacing and when the vacuum plate is in the second position the second conveyor clutches the exposed bottom surfaces of the products in the queue and advances the products in sequence to produce a shingled stream of products having a second spacing.

19. The apparatus of claim 18, further comprising a delivery conveyor operable to deliver a first shingled stream of products to the queue at a substantially constant rate.

20. The apparatus of claim 19, wherein the delivery conveyor is driven by a variable speed drive.

21. The apparatus of claim 18, further comprising a gapper section operable to receive a stream of products and reorient the products into the vertical queue.

22. The apparatus of claim 21, wherein the gapper includes a stop member positioned to deflect the products into the vertical queue.

23. The apparatus of claim 22, wherein the stop member is positioned adjacent the conveyor to define a metering gate therebetween.

24. The apparatus of claim 21, wherein the gapper further includes a support member having first and second support surfaces.

25. The apparatus of claim 24, wherein the first and second support surfaces are spaced apart to define a conveyor space therebetween and wherein the conveyor is disposed at least partially within the space.

26. The apparatus of claim 21, wherein the gapper is movable to discharge the products within the vertical queue to a waste path.

27. The apparatus of claim 18, wherein the conveyor includes a variable speed drive.

28. The apparatus of claim 27, wherein the variable speed drive selectively stops advancement to prevent the conveyor from advancing the second shingled stream of products, thereby defining a gap.

29. The apparatus of claim 18, wherein the fluid communication between the vacuum plate apertures and the vacuum source is selectively terminable to prevent the conveyor from advancing products, thereby defining a gap in the second shingled stream.

30. The apparatus of claim 18, further comprising a nip roller operable to prevent the passage of products from the vertical queue to the exit conveyor.

31. An apparatus comprising:

a first conveyor operable to deliver a first shingled stream of printed products;

a gapper positioned adjacent the first conveyor to receive the first shingled stream and reorient the printed products into a vertical queue;

a second conveyor including a plurality of apertures therein, the second conveyor having an advancement leg movable in an advancement direction;

a vacuum plate disposed beneath the advancement leg, the vacuum plate including a plurality of vacuum apertures and movable parallel to the advancement direction, the vacuum apertures being in fluid communication with a vacuum source such that the vacuum apertures cooperate with the apertures in the second conveyor to sequentially clutch and advance each of the printed products in the queue; and

a third conveyor positioned to receive the printed products from the second conveyor and delivering the printed products as a second shingled stream having a spacing.

32. The apparatus of claim 31, wherein the first conveyor delivers printed products at a substantially constant rate.

33. The apparatus of claim 31, wherein the first conveyor is driven by a variable speed drive.

34. The apparatus of claim 31, wherein the gapper includes a stop member positioned to deflect the printed products into the vertical queue.

35. The apparatus of claim 34, wherein the stop member is positioned adjacent the second conveyor to define a metering gate therebetween.

36. The apparatus of claim 31, wherein the gapper further includes a support member having first and second support surfaces.

37. The apparatus of claim 36, wherein the first and second support surfaces are spaced apart to define a conveyor space therebetween and wherein the second conveyor is disposed at least partially within the space.

38. The apparatus of claim 31, wherein the second conveyor apertures are substantially equally spaced.

39. The apparatus of claim 31, wherein the second conveyor includes a variable speed drive.

40. The apparatus of claim 39, wherein the variable speed drive selectively stops advancement to prevent the second conveyor from advancing the second shingled stream of printed products, thereby defining a gap.

41. The apparatus of claim 31, wherein the vacuum plate moves between a first position and a second position to vary the spacing between adjacent printed products within the second shingled stream of printed products.

42. The apparatus of claim 31, wherein the fluid communication between the vacuum plate and the vacuum is selectively terminable to prevent the second conveyor from advancing printed products, thereby defining a gap in the second shingled stream of printed products.

43. The apparatus of claim 31, further comprising a nip roller operable to prevent the passage of printed products from the vertical queue to the third conveyor.

44. The apparatus of claim 31, wherein the gapper is movable to discharge the printed products within the vertical queue to a waste path.

45. The apparatus of claim 31, wherein the apertures in the second conveyor are substantially equally spaced from one another and wherein movement of the vacuum plate between a first position and a second position varies the spacing between adjacent shingles in the second shingled stream between a first spacing and a second spacing independent of the spacing between the apertures in the second conveyor.

46. A method of changing the spacing between adjacent products in a stream of products, comprising:

orienting the products in a vertical queue;

passing a conveyor beneath the queue, the conveyor having a plurality of substantially equally spaced apertures;

fluidly connecting a first aperture with a vacuum source as it reaches a first point such that it clutches a first product in the queue;

advancing the conveyor to advance the first product a first distance;

exposing a portion of a second product immediately above the first product adjacent the first point;

fluidly connecting a second aperture with the vacuum source as it reaches the first point such that it clutches the exposed portion of the second product immediately above the first product and advances the second product to define a shingled stream of products; and

moving an adjusting member to move the first point relative to the queue to adjust the spacing between adjacent products in the shingled stream of products.

47. The method of claim 46, further comprising delivering an input shingled stream of products to the vertical queue.

48. The method of claim 46, wherein movement of the adjusting member changes the spacing between adjacent products independent of the speed of the conveyor and the spacing between the apertures in the conveyor.

49. The method of claim 46, further comprising interrupting the fluid communication between the vacuum source and the conveyor apertures to interrupt the shingled stream of products and define a gap.

50. The method of claim 46, further comprising stopping the conveyor to interrupt the shingled stream of products and define a gap.

51. The method of claim 46, further comprising passing the stream of products through a metering gate positioned adjacent the conveyor.

52. The method of claim 51, wherein the metering gate includes a nip roller operable to prevent the passage of the stream of products and define a gap.

53. A method of providing a gap in a shingled stream of products, comprising:

positioning a support member in the path of the shingled stream of products, the support member receiving the shingled stream from a first conveyor and reorienting them into a vertical queue supported on the support member;

operating a second conveyor having a plurality of equally spaced apertures therein;

providing a vacuum to at least one of the apertures such that the at least one aperture clutches a first product in the vertical queue and advances the product to produce a second shingled stream of products;

operating a third conveyor to conduct the second shingled stream of products away from the second conveyor; and

selectively interrupting the second shingled stream from advancing to the third conveyor to define the gap.

54. The method of claim 53, further comprising moving an adjusting member to change the spacing between adjacent products independent of the speed of the second conveyor and the spacing between the apertures in the second conveyor.

55. The method of claim 53, further comprising selectively interrupting the fluid communication between the vacuum source and the second conveyor apertures to interrupt the second shingled stream and define the gap.

56. The method of claim 53, further comprising stopping the second conveyor to interrupt the shingled stream and define the gap.

57. The method of claim 53, further comprising passing the stream of products through a metering gate positioned adjacent the conveyor.

58. The method of claim 57, wherein the metering gate includes a nip roller operable to prevent the passage of the second stream and define the gap.

59. The method of claim 53, further comprising accelerating the second conveyor to increase the size of the gap.

60. A method of producing a product log, comprising:

feeding a first stream of products to a queue;

vertically stacking the products in the queue;

removing individual products from the bottom of the queue to produce a second shingled stream of products having a spacing between adjacent products;

feeding the second shingled stream from a conveyor to a stacker;

accelerating the conveyor to substantially deplete the queue to complete the product log;

stopping the feeding of products from the queue to the conveyor to define a gap in the second shingled stream; and

restarting the feeding of products from the queue to the second shingled stream to begin a new log.

61. The method of claim 60, further comprising operating a second conveyor to remove individual products from the queue to define the second shingled stream.

62. The method of claim 61, wherein the second conveyor is selectively stopped to produce the gap in the second shingled stream.

63. The method of claim 61, further comprising applying a vacuum through apertures in the second conveyor such that the second conveyor is able to selectively clutch products in the queue.

64. The method of claim 63, wherein the connection between the vacuum and the apertures in the second conveyor is selectively broken to produce the gap in the second shingled stream.

65. The method of claim 63, further comprising moving an adjusting member to change the spacing between adjacent products in the second shingled stream independent of the speed of the second conveyor and the spacing between the apertures in the second conveyor.

66. The method of claim 60, further comprising passing the shingled stream of products through a metering gate positioned adjacent the conveyor.

67. The method of claim 66, wherein the metering gate includes a nip roller operable to prevent the passage of the second shingled stream and define the gap.